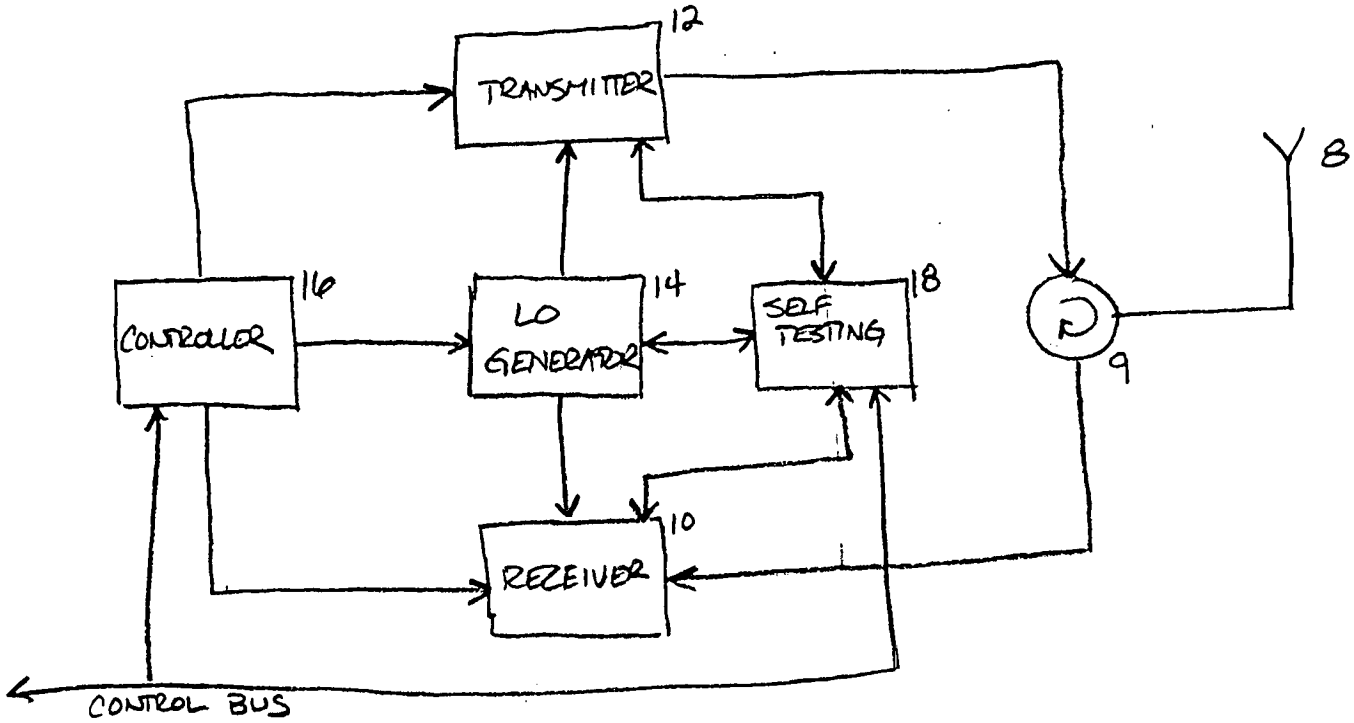


FIG. 1

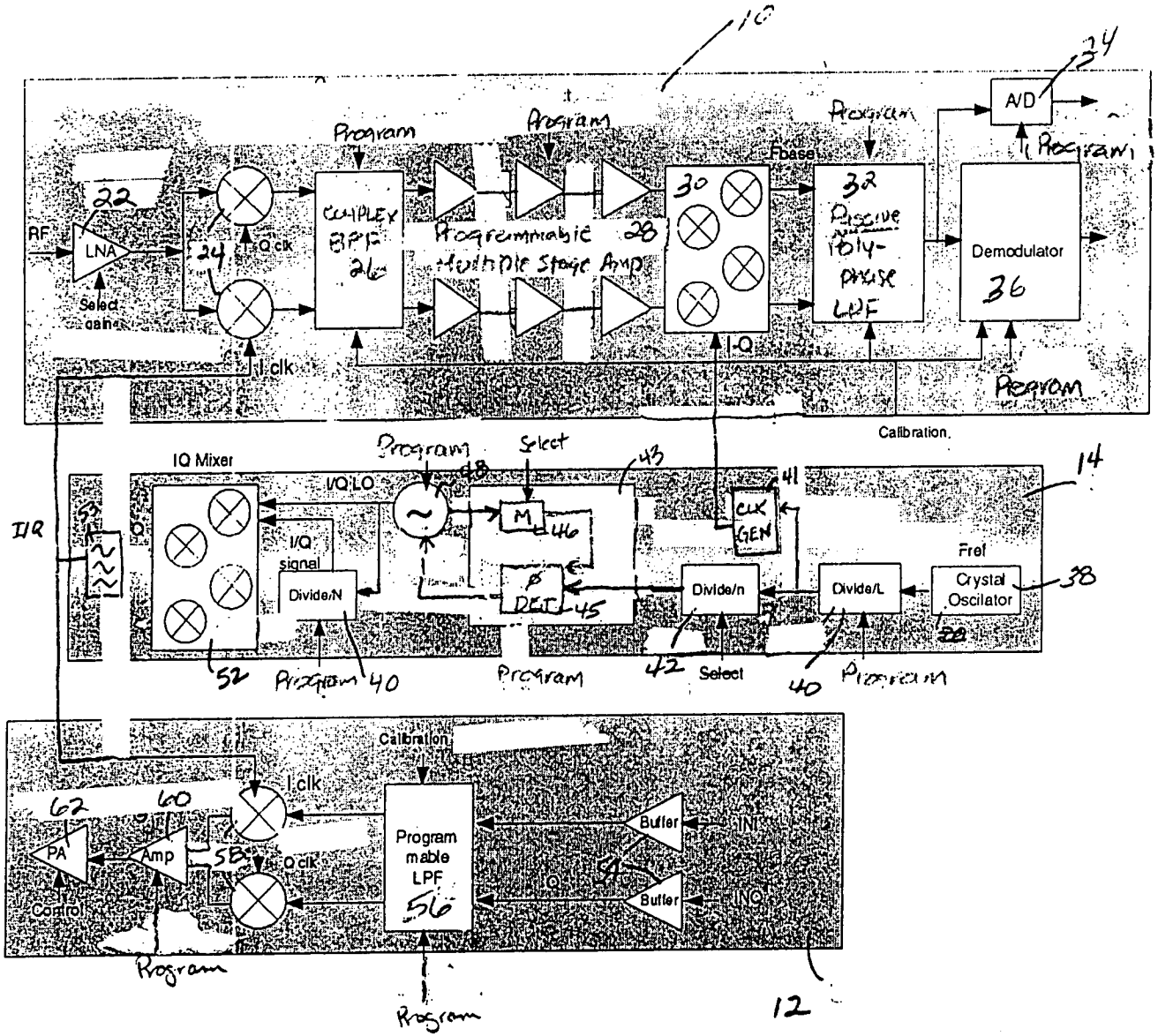

10
34
A/D
Program
Program
Program
Fbase
RF
LNA
22
24
Q clk
I clk
Select gain
Complex BPF 26
Programmable Multiple Stage Amp
28
30
I-Q
32
Passive Poly-phase LPF
Demodulator
36
Program
Calibration
IQ Mixer
I/Q LO
Program
Select
48
43
41
14
IIR
53
I/Q signal
Divide/N
M
46
Ø
DET
45
CLK GEN
Fref
Divide/n
Divide/L
Crystal Oscilator
38
52
Program
40
Program
42
Select
40
Program
Calibration
I clk
62
60
PA
Amp
58
Q clk
Control
Program
Program mable LPF
56
Buffer
INI
54
Q
Buffer
INQ
Program
12

FIG. 2

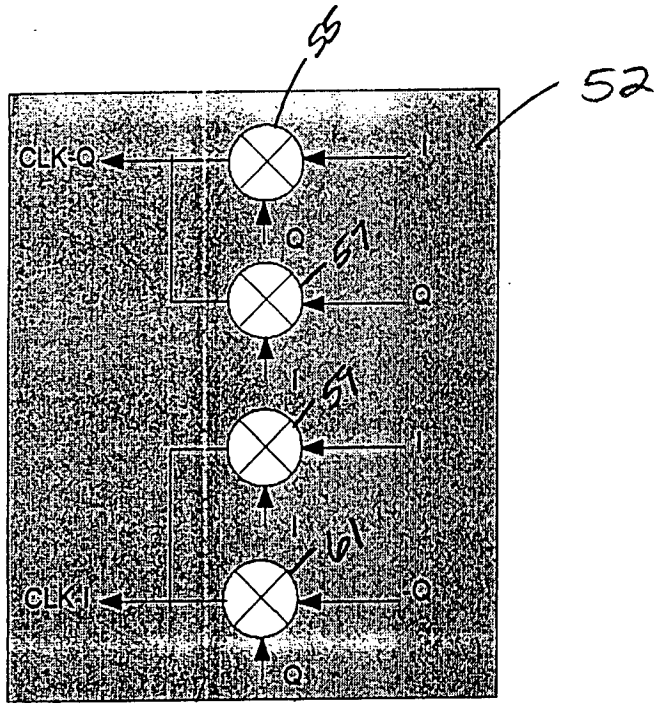


FIG. 3

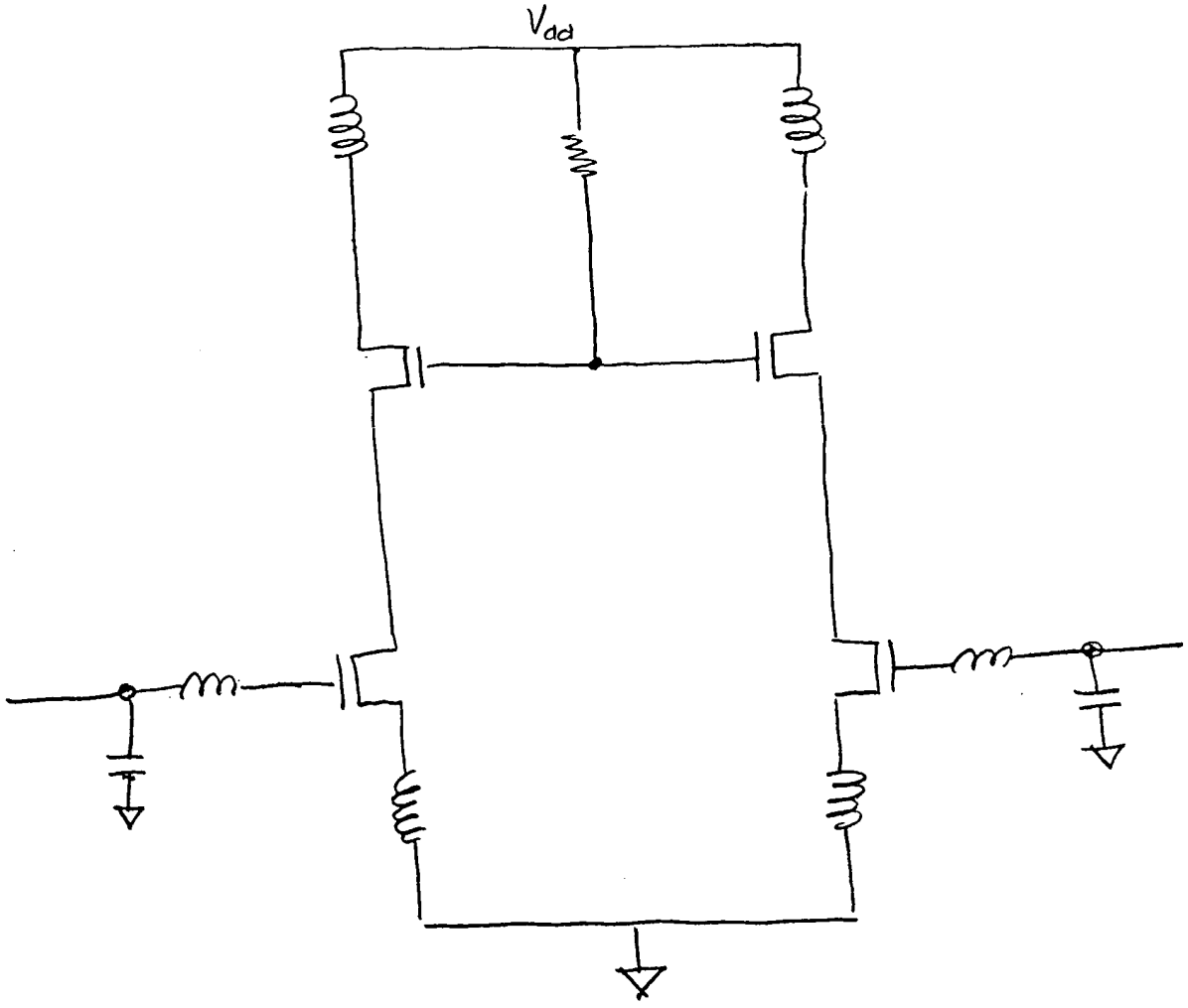


FIG. 4 (a)

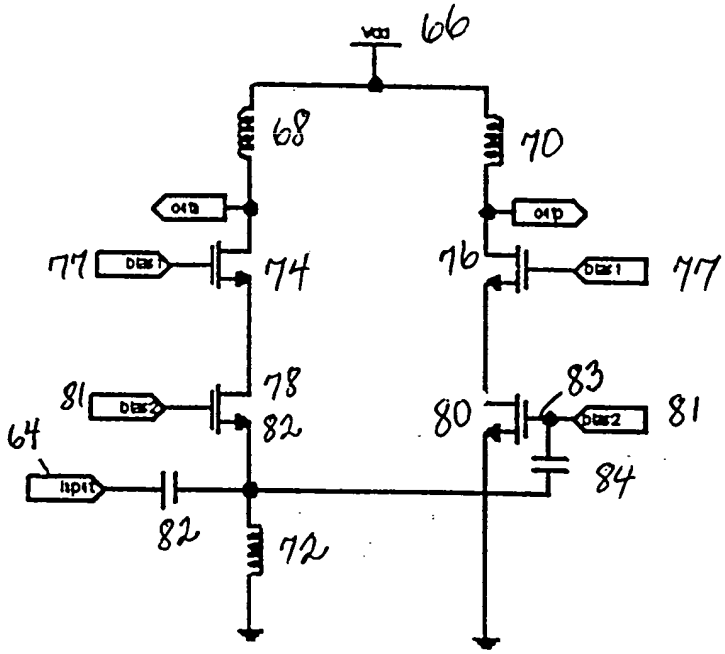

Vdd
66
68
70
outn
outp
77
Bias1
74
76
Bias1
77
81
Bias2
78
83
80
Bias2
81
64
82
inpt
82
72
84

FIG. 4

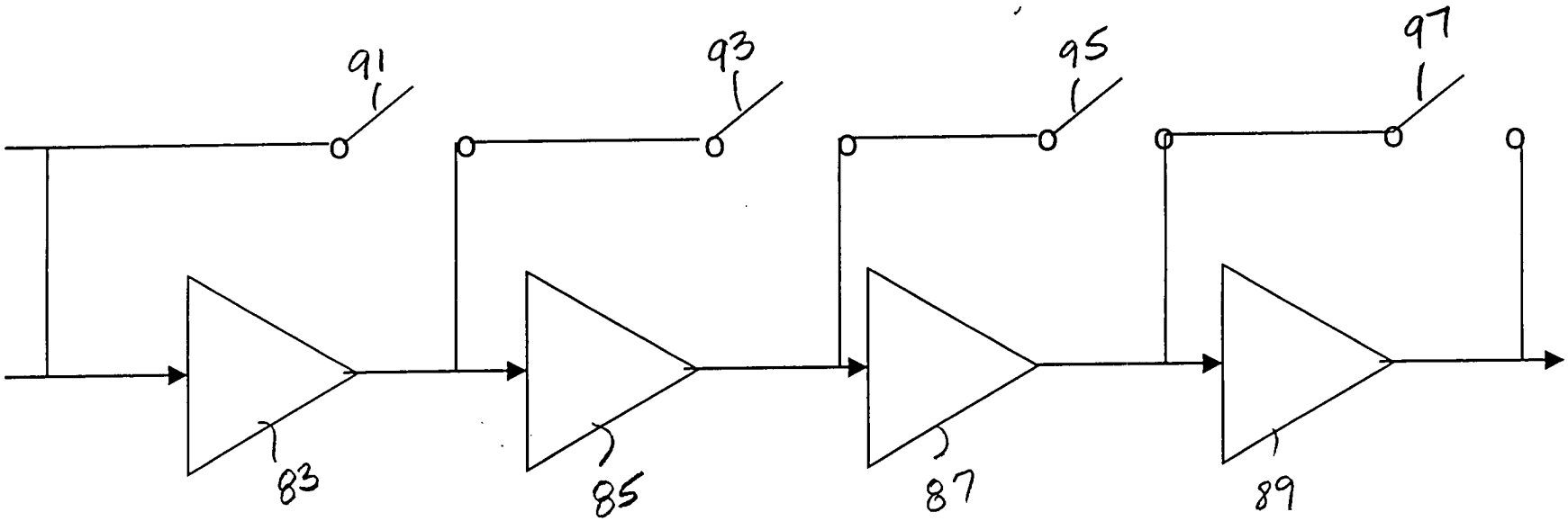


FIG. 5

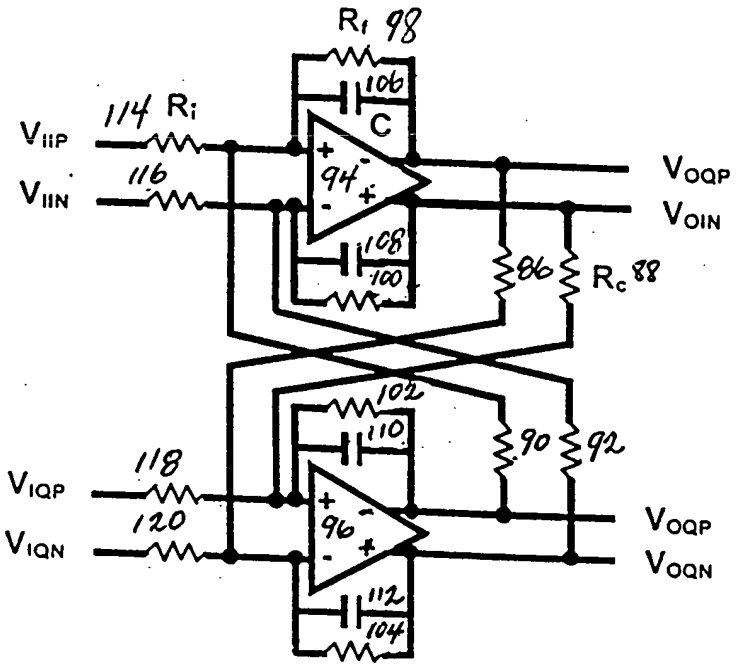

R_f 98
106
C
114 R_i
V_{IIP}
116
V_{IIN}
94
108
100
86
R_c 88
V_{OQP}
V_{OIN}
102
110
90
92
118
V_{IQP}
120
V_{IQN}
96
V_{OQP}
V_{OQN}
112
104

FIG. 6

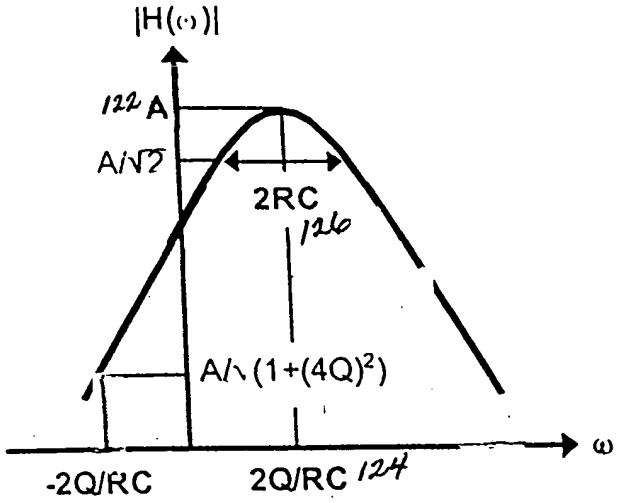


FIG. 7

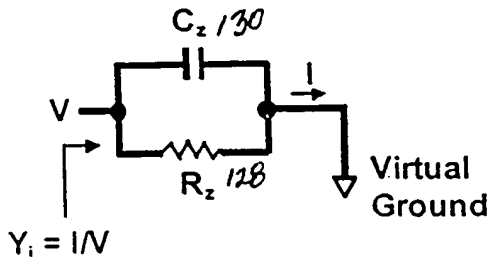


FIG. 8

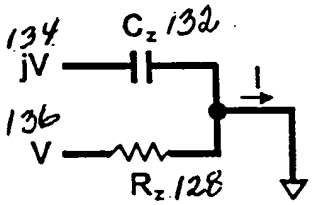


FIG. 9

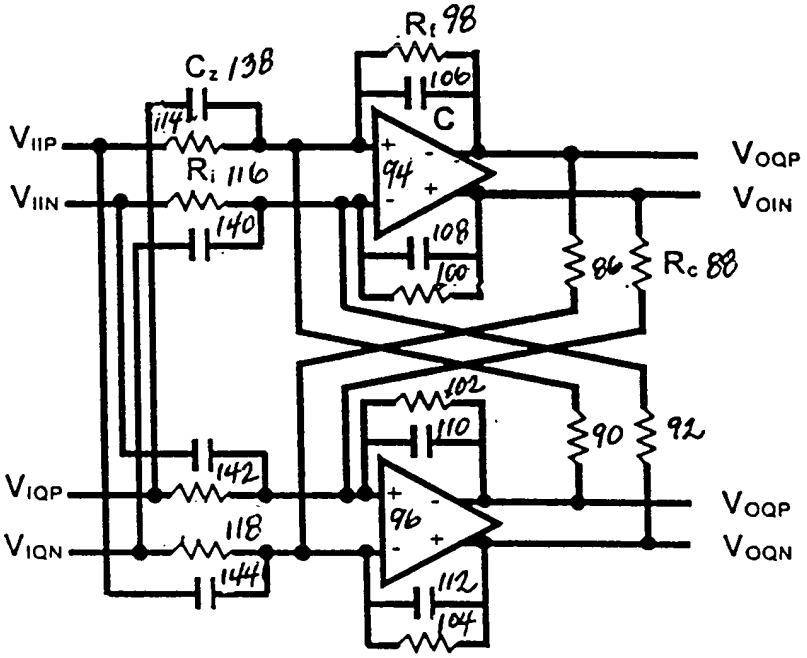

R_f 98
C_z 138
106
C
114
V_{IIP}
R_i 116
V_{IIN}
94
V_{OQP}
V_{OIN}
140
108
100
86
R_c 88
102
110
90
92
142
V_{IQP}
118
V_{IQN}
96
V_{OQP}
V_{OQN}
144
112
104

FIG. 10

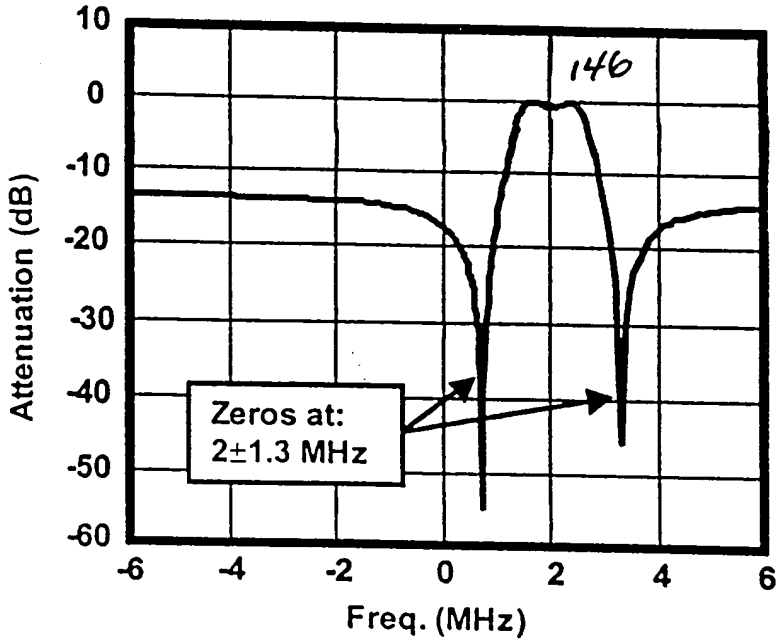

10
0
-10
-20
-30
-40
-50
-60
Attenuation (dB)
-6
-4
-2
0
2
4
6
Freq. (MHz)
146
Zeros at:
2±1.3 MHz

FIG. 11

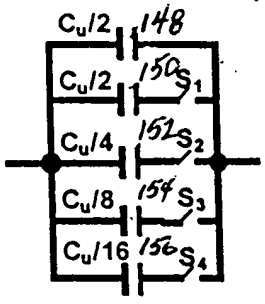


FIG. 12(a)

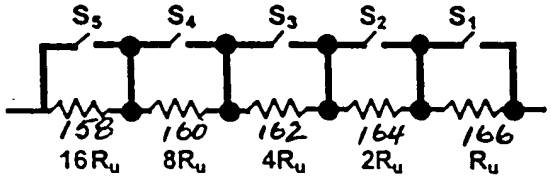


FIG. 12(b)

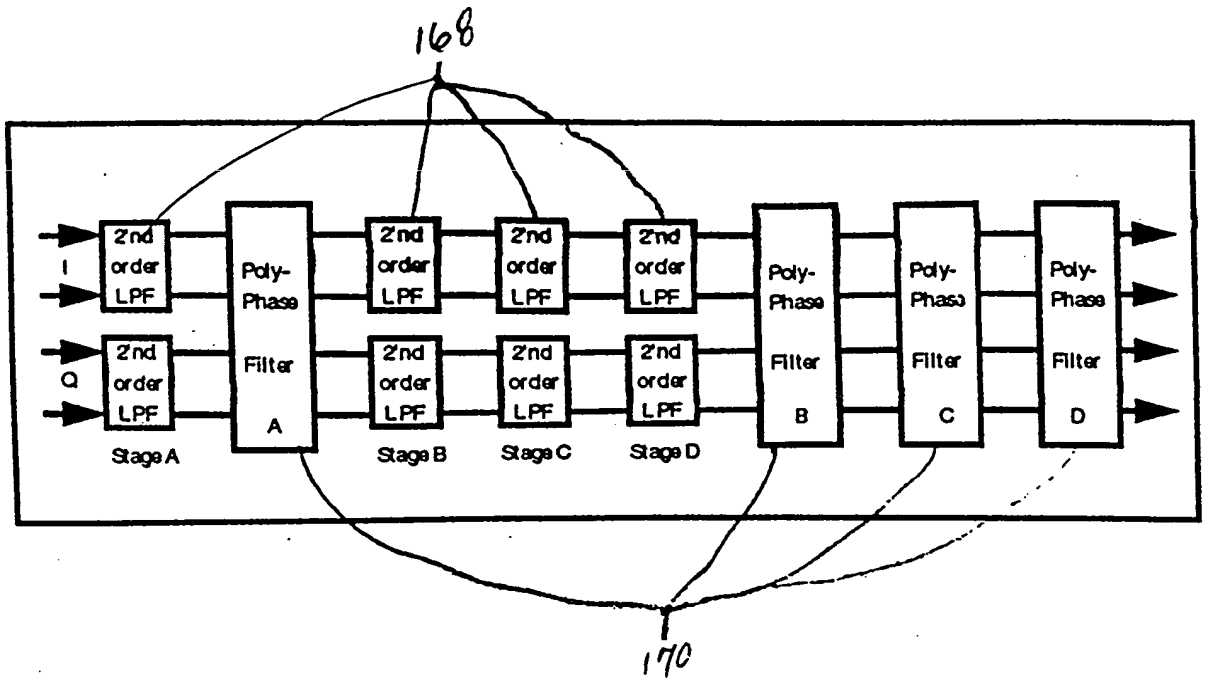

168
I
Q
2nd order LPF
Poly-Phase Filter A
Poly-Phase Filter B
Poly-Phase Filter C
Poly-Phase Filter D
Stage A
Stage B
Stage C
Stage D
170

FIG. 13

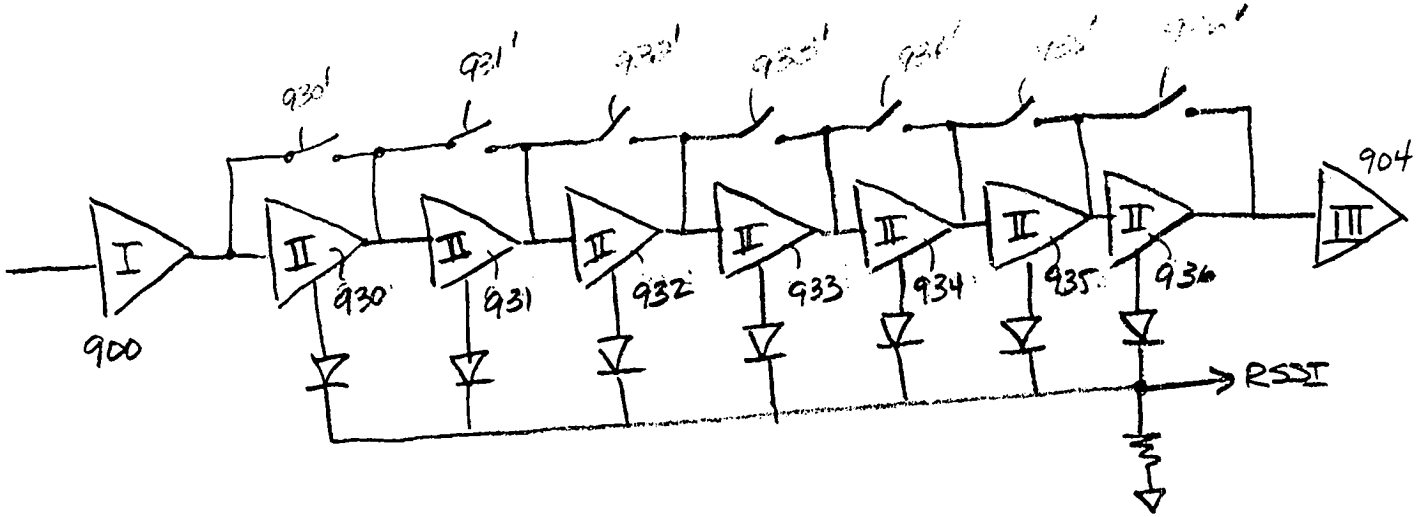

930'
931'
904
I
II
II
II
II
II
II
III
900
930
931
932
933
934
935
936
RSSI

FIG. 14

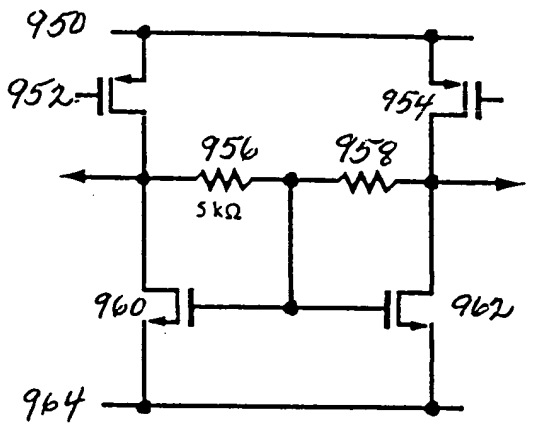


FIG. 15

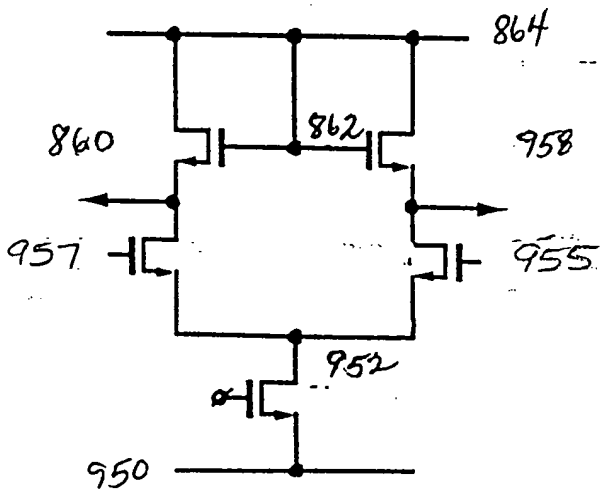


FIG. 16(a)

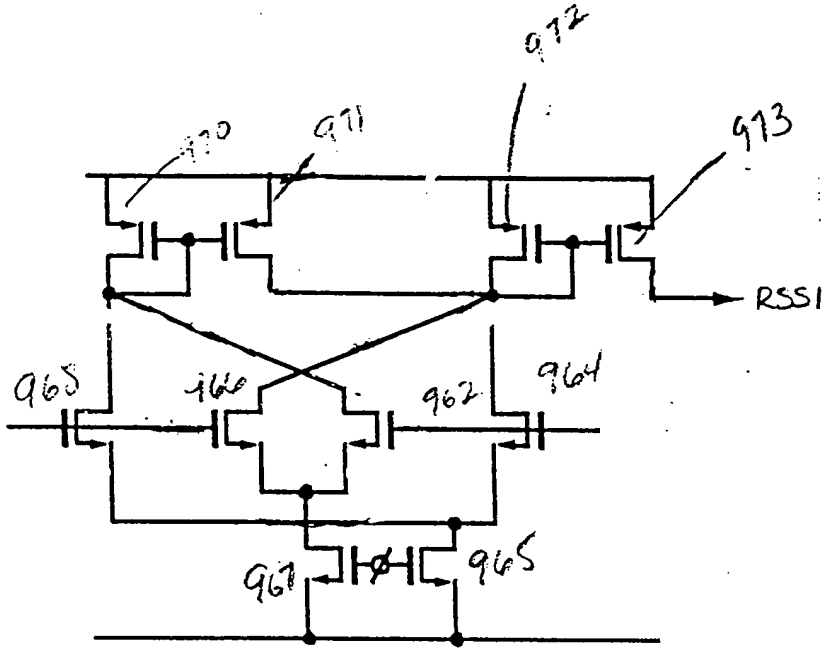


FIG. 16(b)

FIG. 17(a)

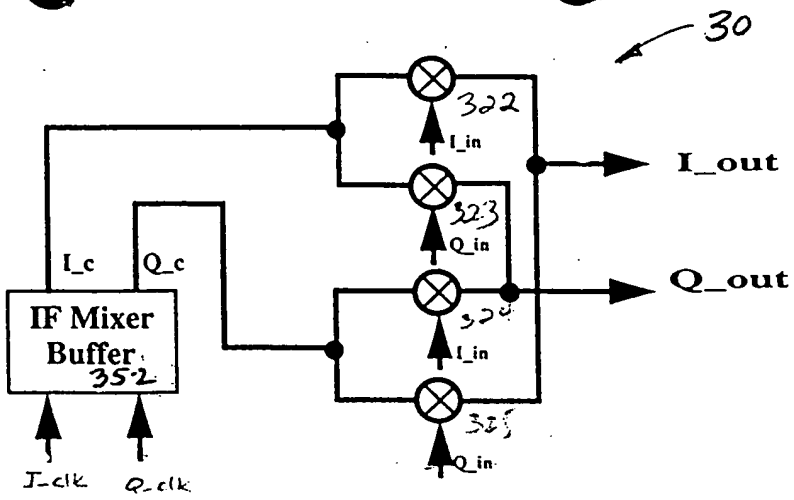
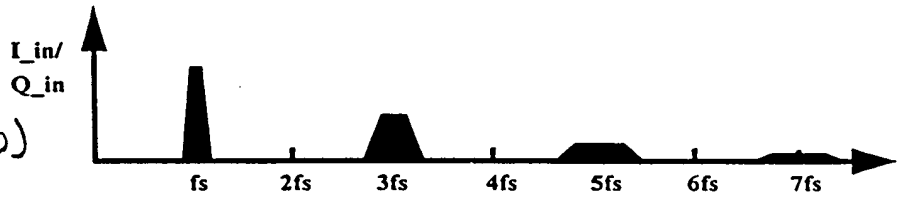
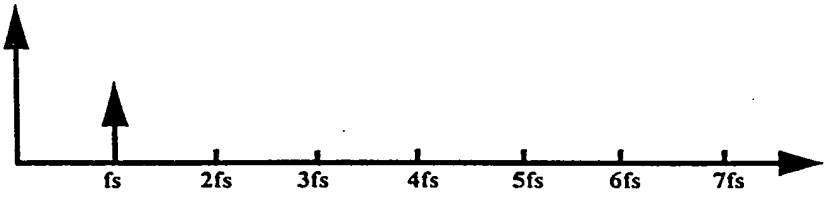


FIG. 17(b)



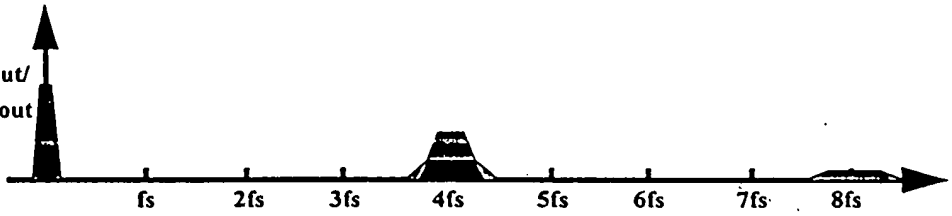
Limited IF Signal Spectrum

FIG. 17(c)



Sinusoidal Input Spectrum

FIG. 17(d)



IF MixerOutput Spectrum

FIG. 18

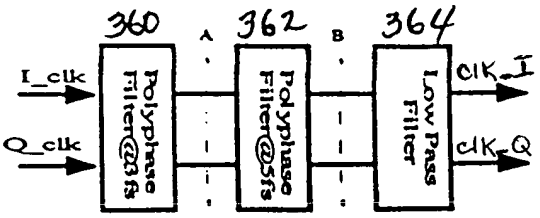
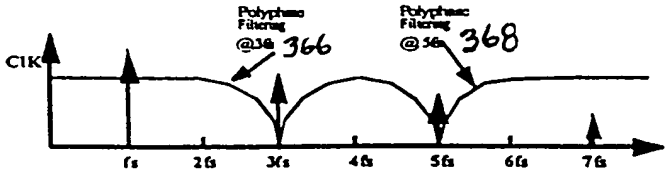
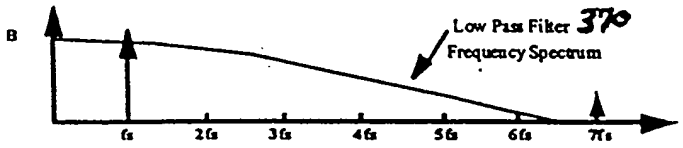


FIG. 19(a)



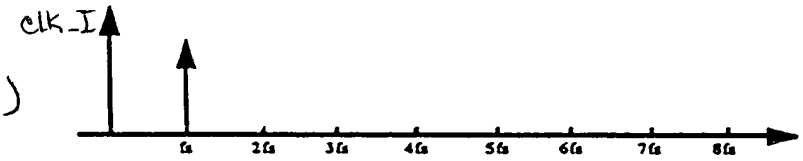
Differential Input Clock Signal Spectrum

FIG. 19(b)

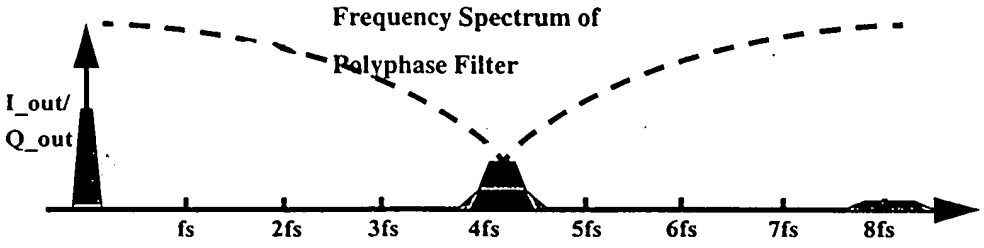


Signal Spectrum After 3fs and 5fs Polyphase

FIG. 19(c)

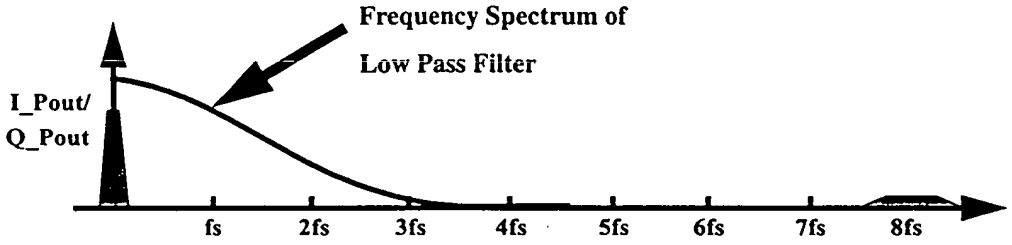


Sinusoidal Signal Generation After Low Pass Filter



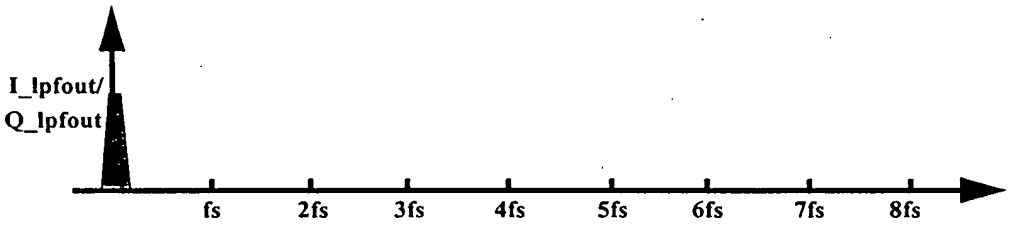
Signal Spectrum at Polyphase Input

FIG. 20(a)



Signal Spectrum at Polyphase Output

FIG. 20(b)



Signal Spectrum at Low Pass Filter Output

FIG. 20(c)

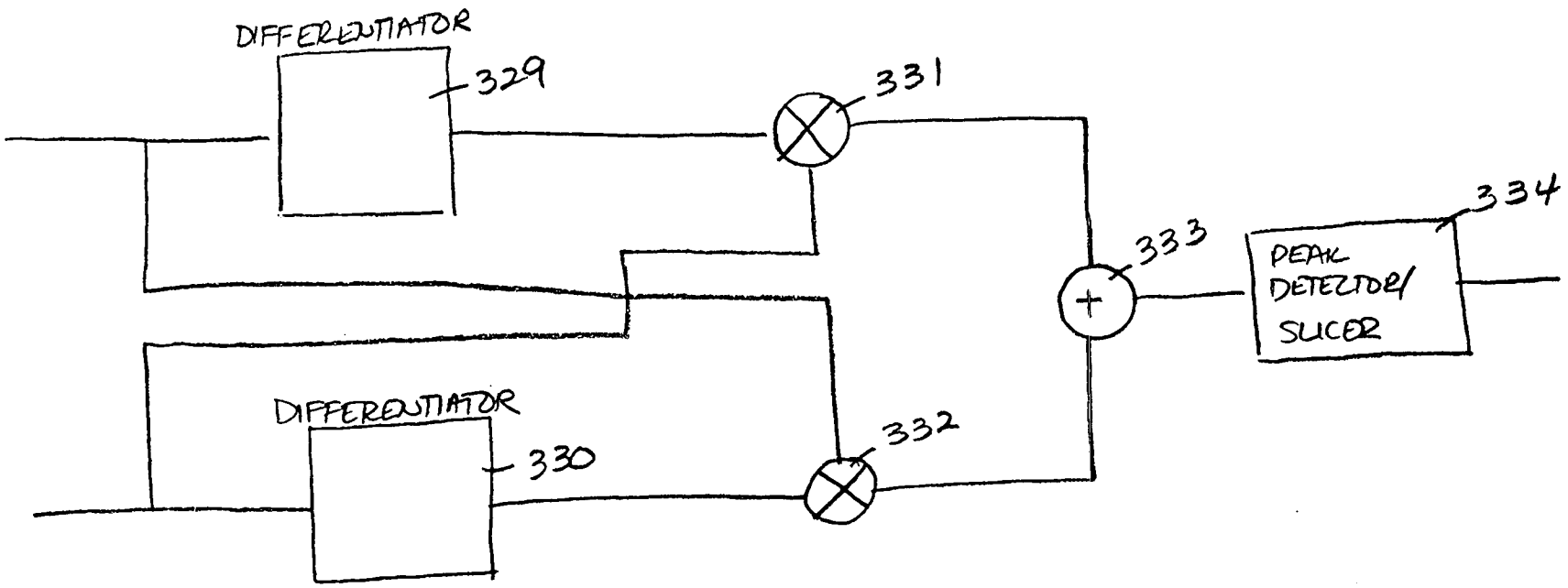

DIFFERENTIATOR
329
331
334
333
PEAK DETECTOR/ SLICER
DIFFERENTIATOR
330
332

FIG. 21

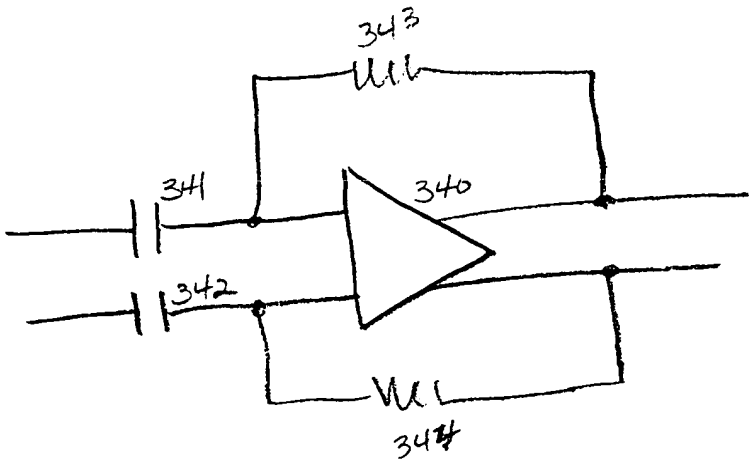


FIGURE 22

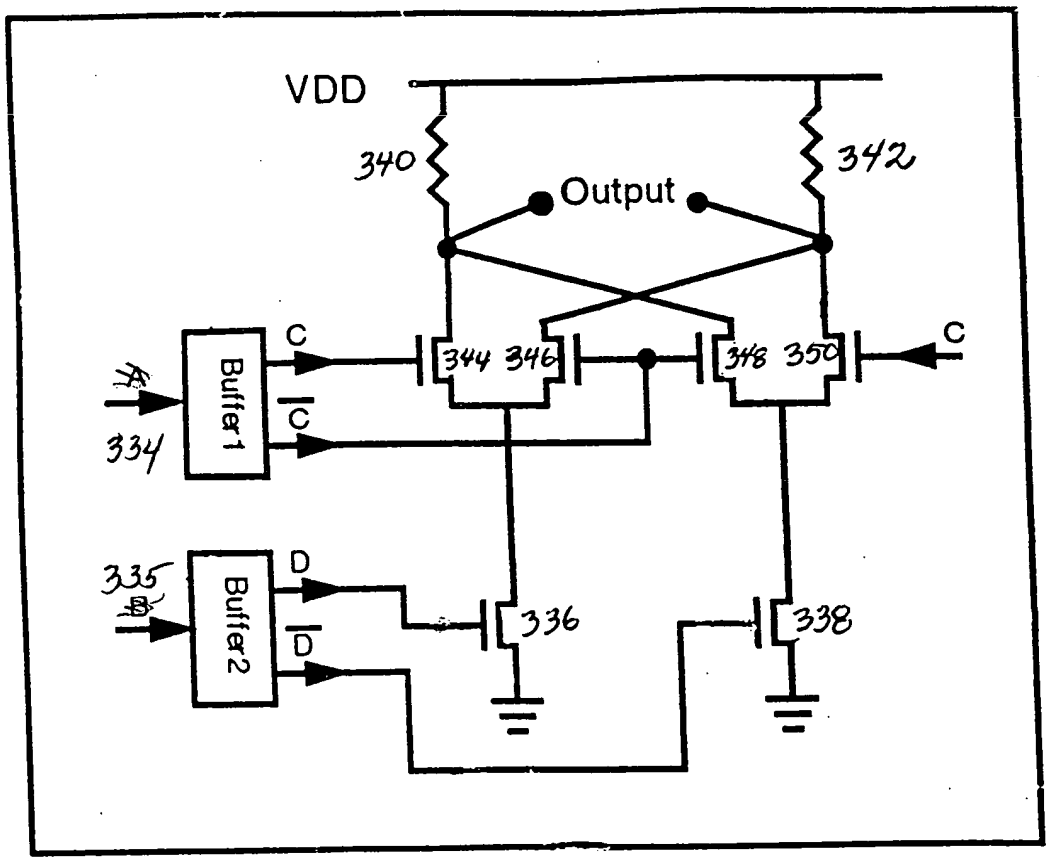

VDD
340
342
Output
C
344
346
348
350
C
Buffer1
C
334
335
Buffer2
D
D
336
338

FIG. 23

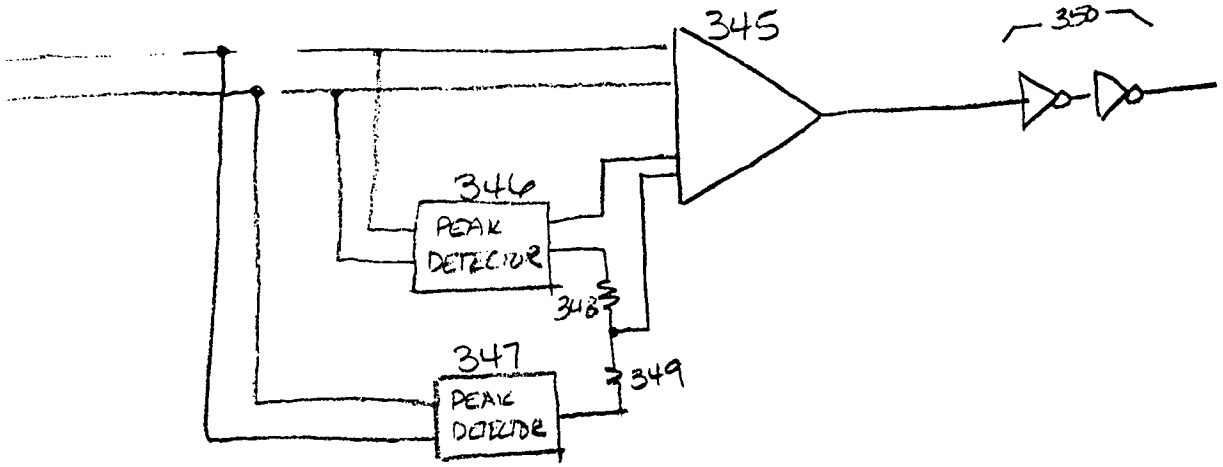


FIGURE 24

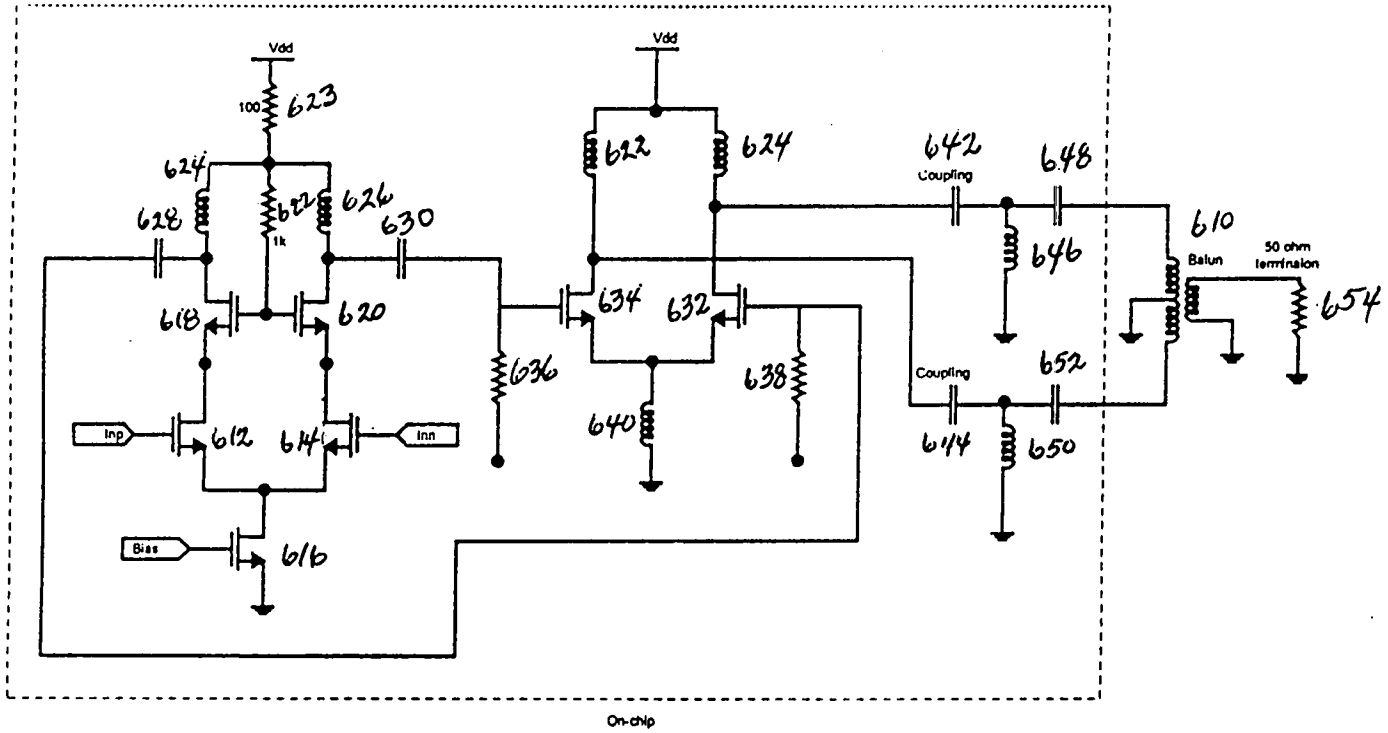

Vdd
100
623
624
628
622
1k
626
630
618
620
Inp
612
614
Inn
Bias
616
636
Vdd
622
624
634
632
638
640
642
Coupling
648
646
610
Balun
50 ohm
termination
654
Coupling
652
614
650
On-chip

FIG. 25

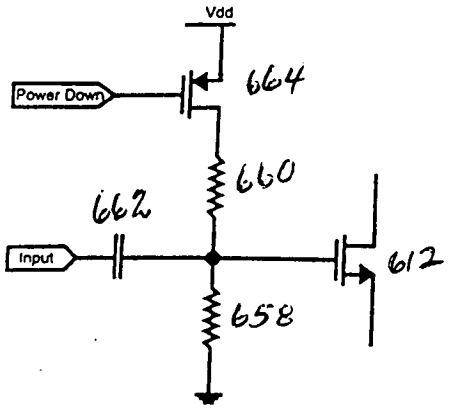


FIG. 26(a)

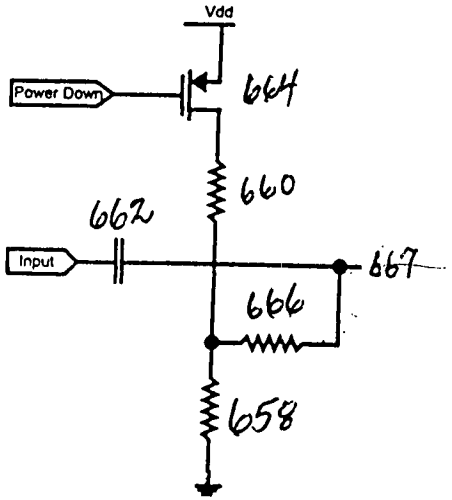


FIG. 26(b)

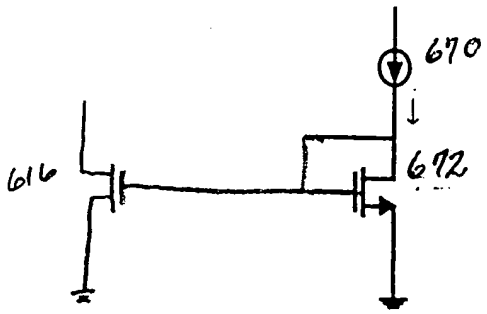


FIG. 27

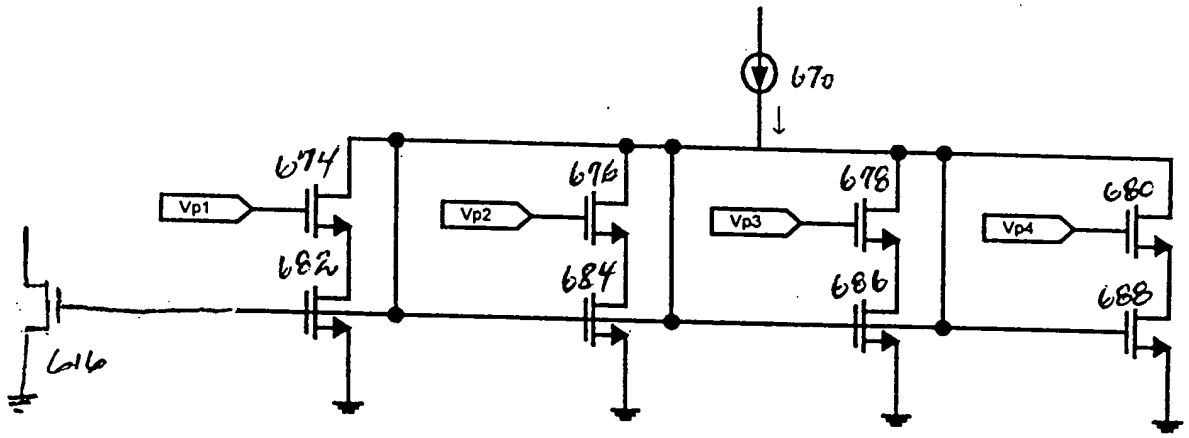


FIG. 28

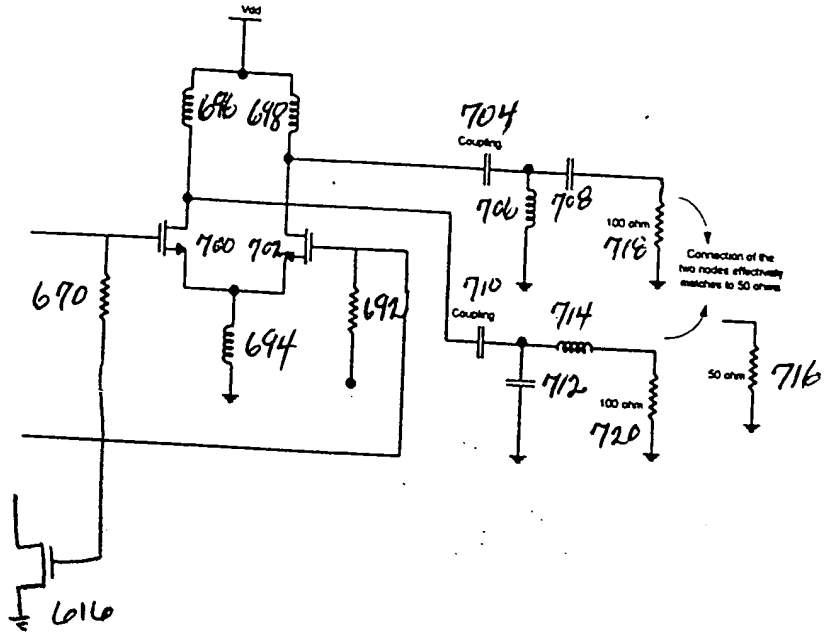

Vdd
696
698
704
Coupling
706
708
100 ohm
716
Connection of the two nodes effectively switches in 50 ohms
700
702
710
Coupling
714
670
694
692
712
100 ohm
720
50 ohm
716
6016

FIG. 29

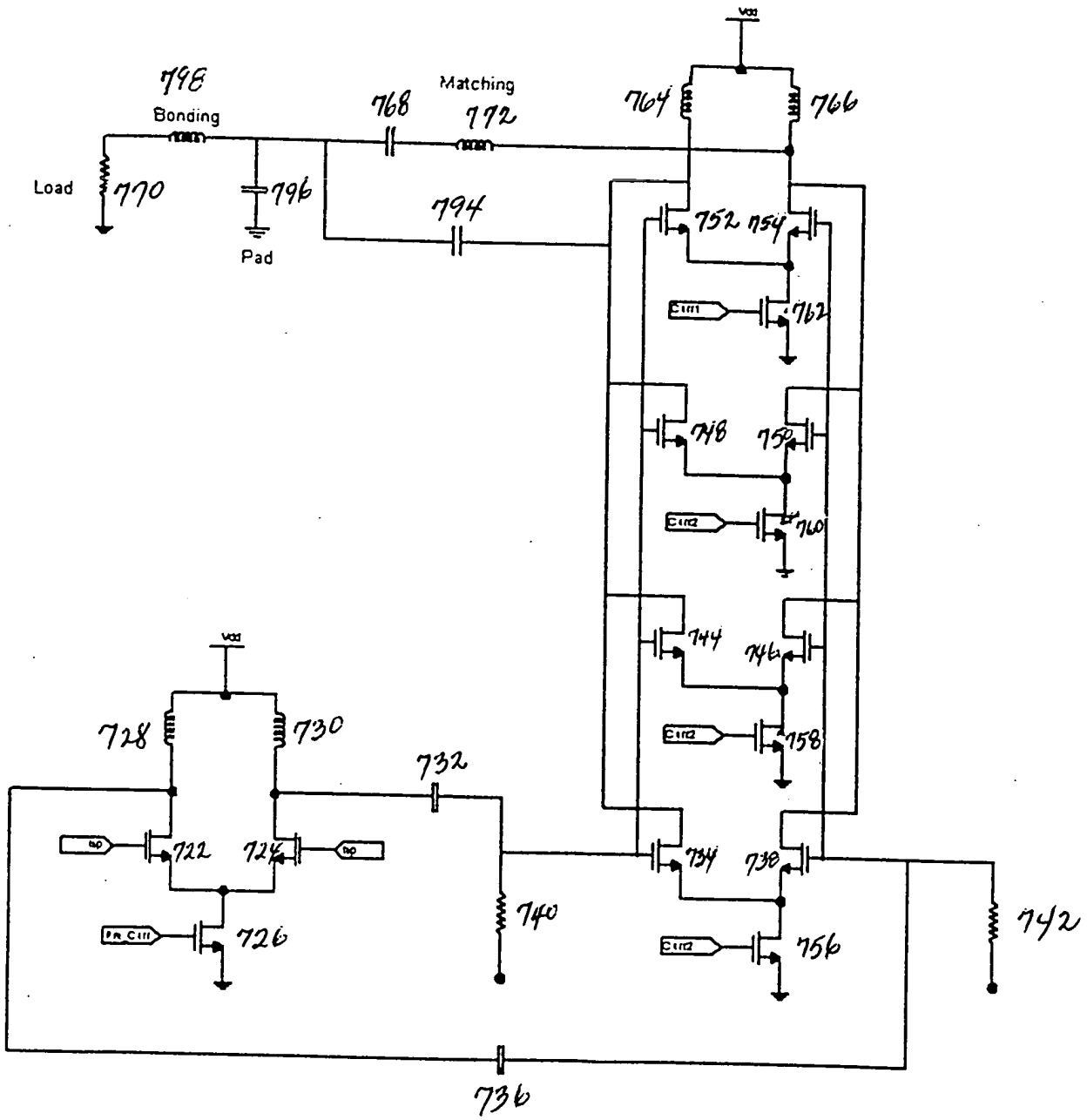

798
Bonding
768
Matching
772
764
766
Load
770
796
Pad
794
752
754
762
748
750
760
744
746
758
728
730
732
722
724
726
734
736
740
742
756

FIG. 30

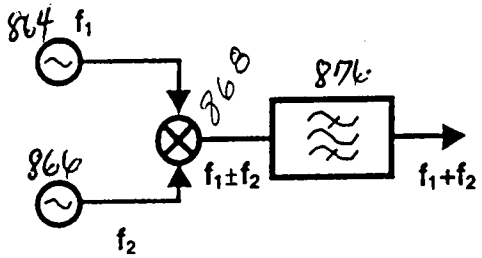


FIG. 31 (a)

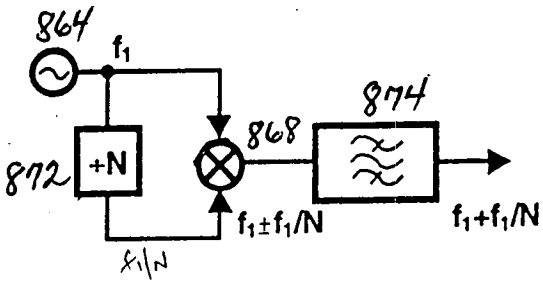


FIG. 31 (b)

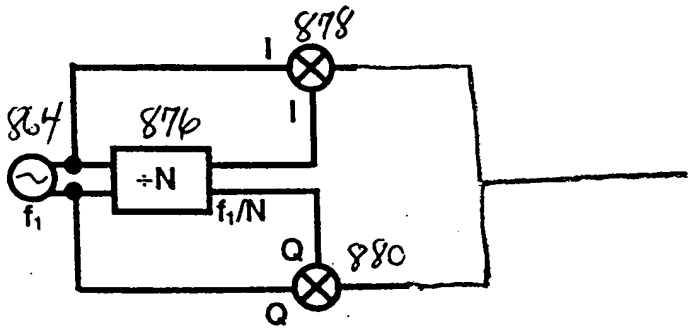


FIG. 32

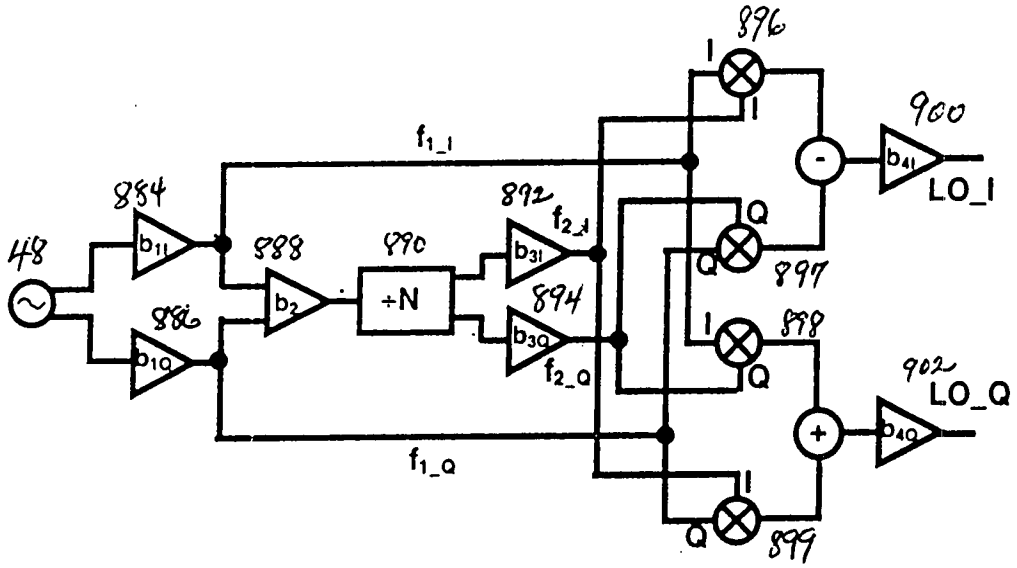

48
884
886
888
890
892
894
896
897
898
899
900
902
b_{11}
b_{1Q}
b_2
÷N
b_{31}
b_{3Q}
f_{2_I}
f_{2_Q}
f_{1_I}
f_{1_Q}
b_{41}
b_{4Q}
LO_I
LO_Q
I
Q
+
-

FIG. 33

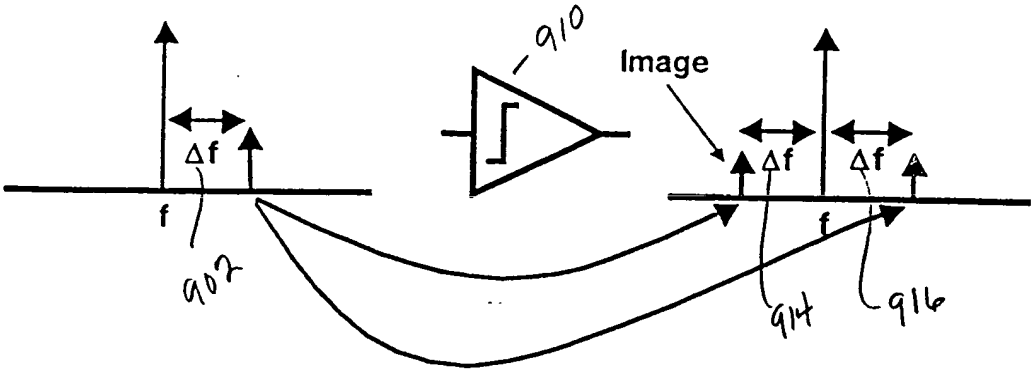


FIG. 33(a)

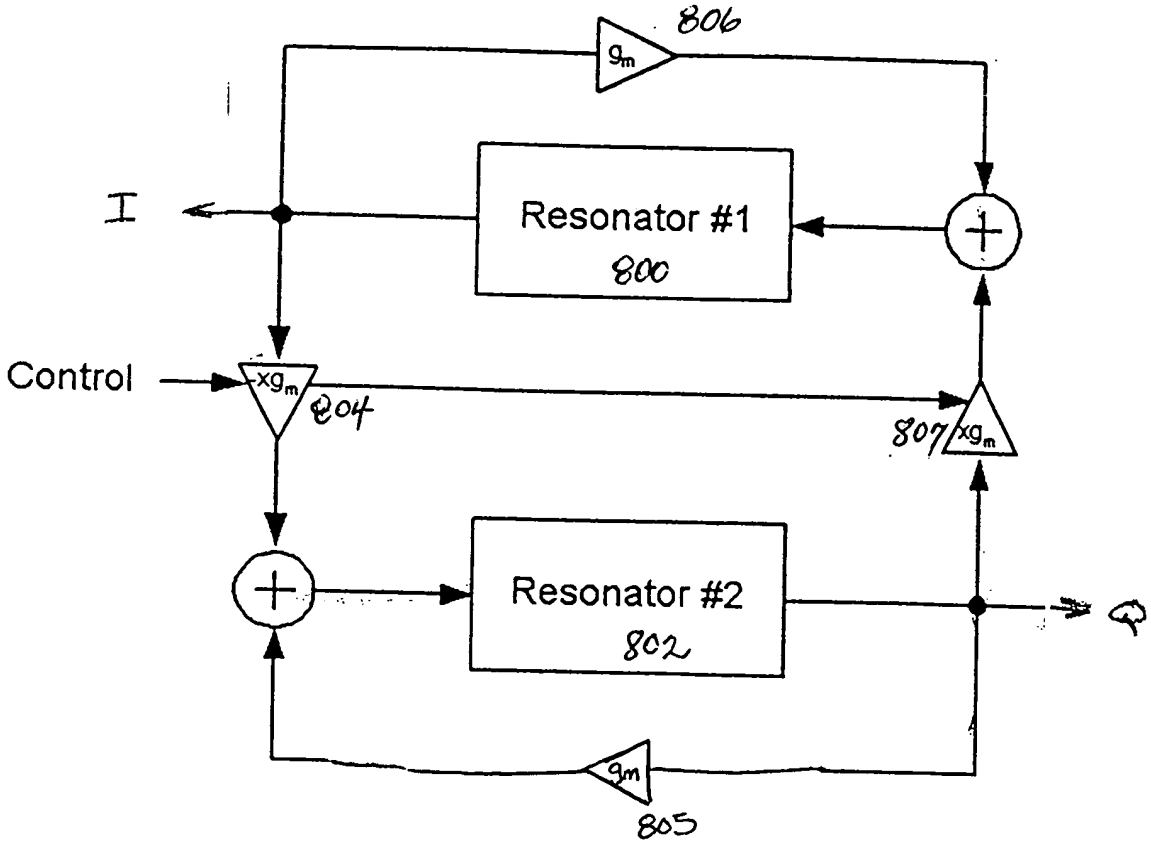

806
g_m
I
Resonator #1
800
Control
xg_m
804
807
xg_m
Resonator #2
802
Q
g_m
805

FIG. 34

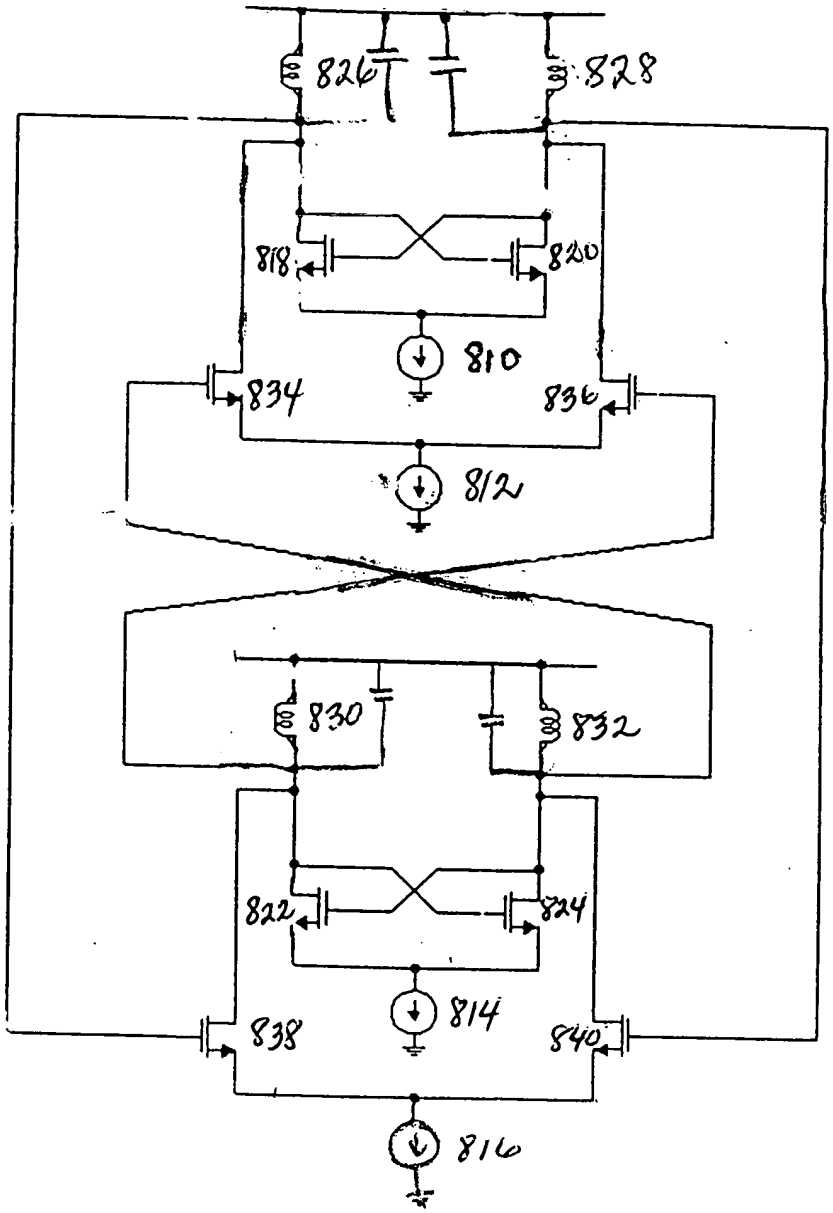
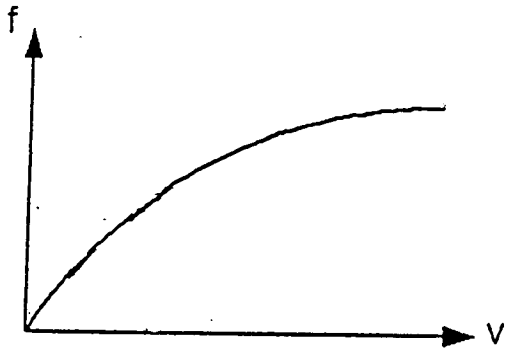
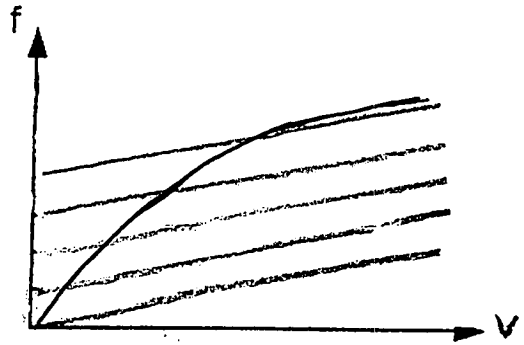


FIG. 35



Typical VCO Tuning Curve

FIG. 36(a)



Segmented VCO Tuning Curve

FIG. 36(b)

FIG. 37(a)

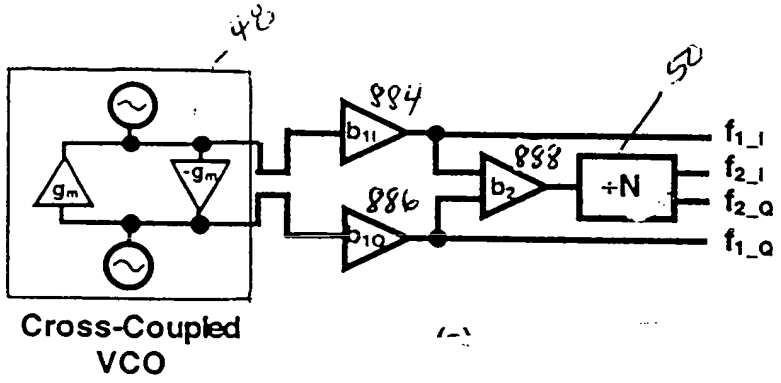
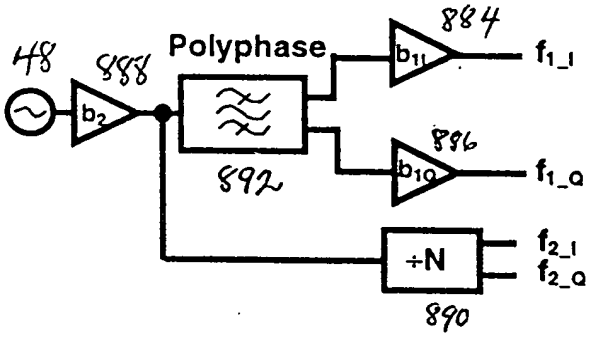


FIG. 37(b)



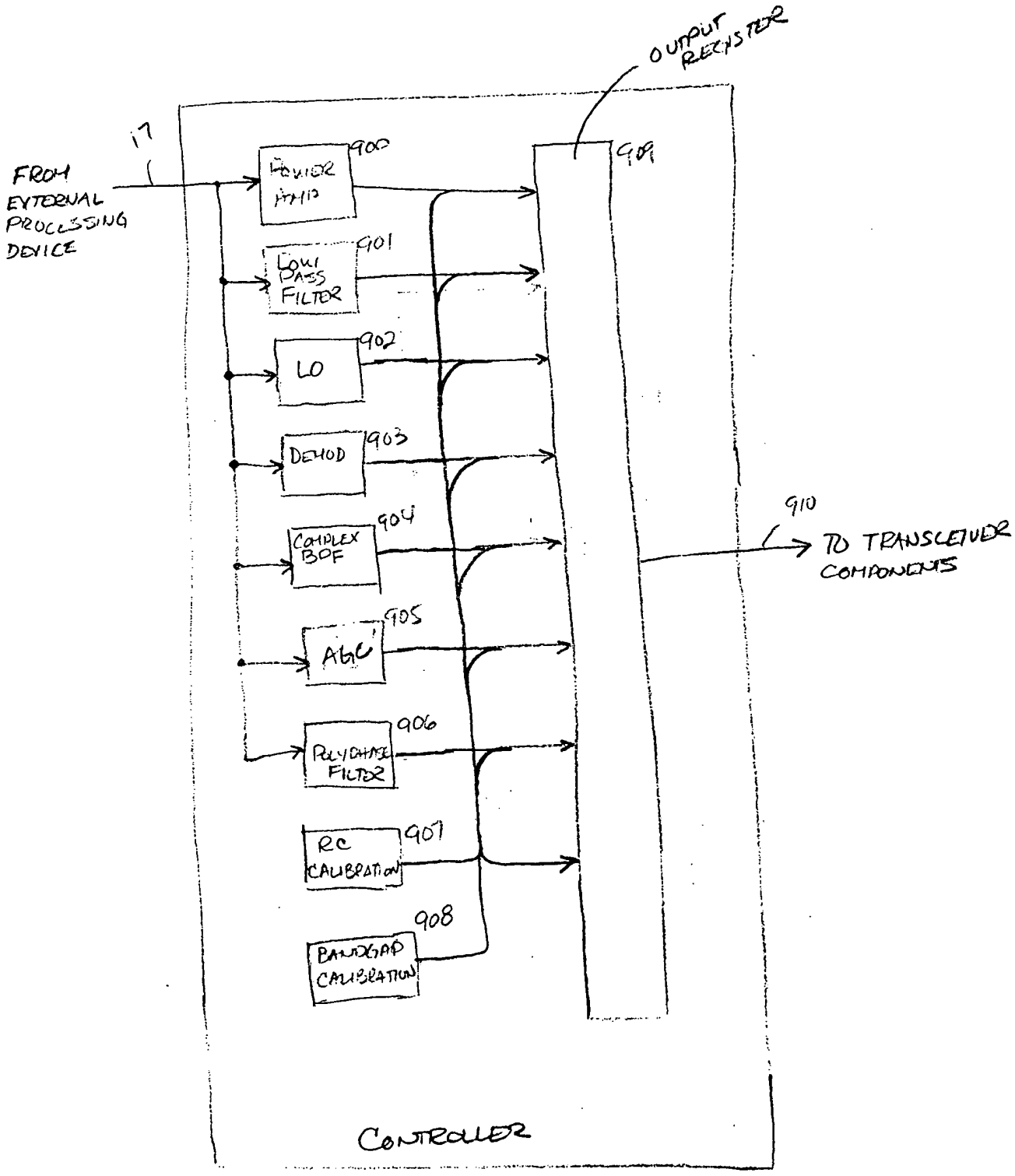

OUTPUT REGISTER
17
FROM EXTERNAL PROCESSING DEVICE
900
909
LOW PASS FILTER
901
LO
902
DEMOD
903
COMPLEX BPF
904
910
TO TRANSCEIVER COMPONENTS
AGC
905
POLYPHASE FILTER
906
RC CALIBRATION
907
908
BANDGAP CALIBRATION
CONTROLLER

FIGURE 38

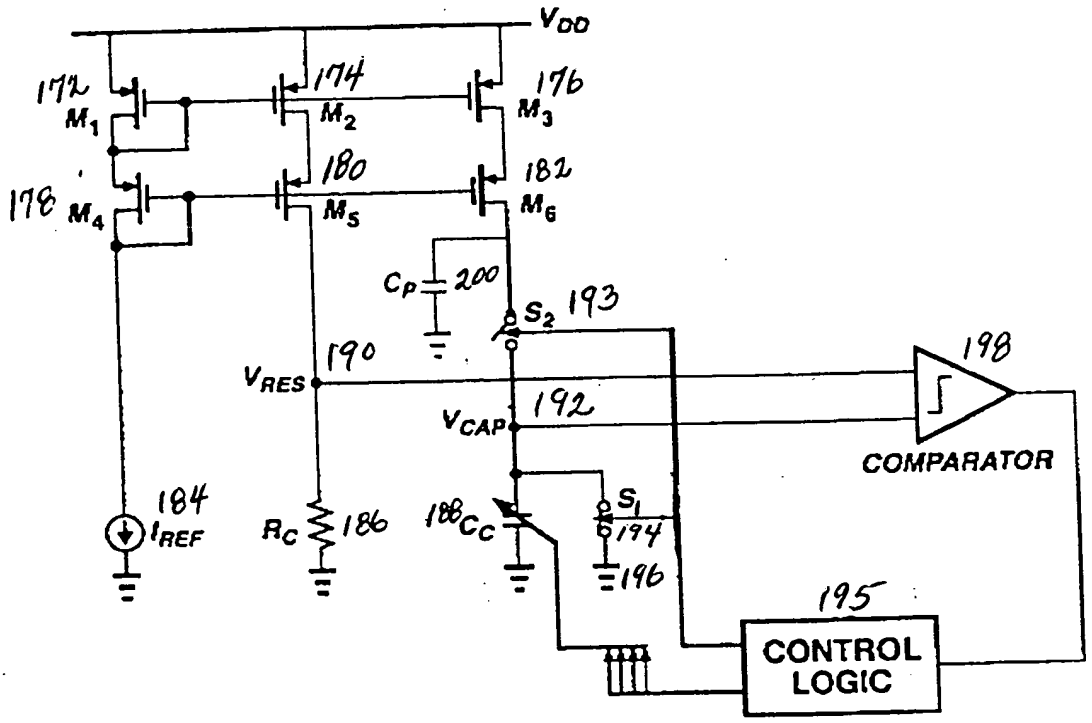

V_{DD}
172
M_1
174
M_2
176
M_3
178
M_4
180
M_5
182
M_6
C_P 200
S_2 193
190
V_{RES}
192
V_{CAP}
198
COMPARATOR
184
I_{REF}
R_C 186
188 C_C
S_1 194
196
195
CONTROL LOGIC

FIG. 39

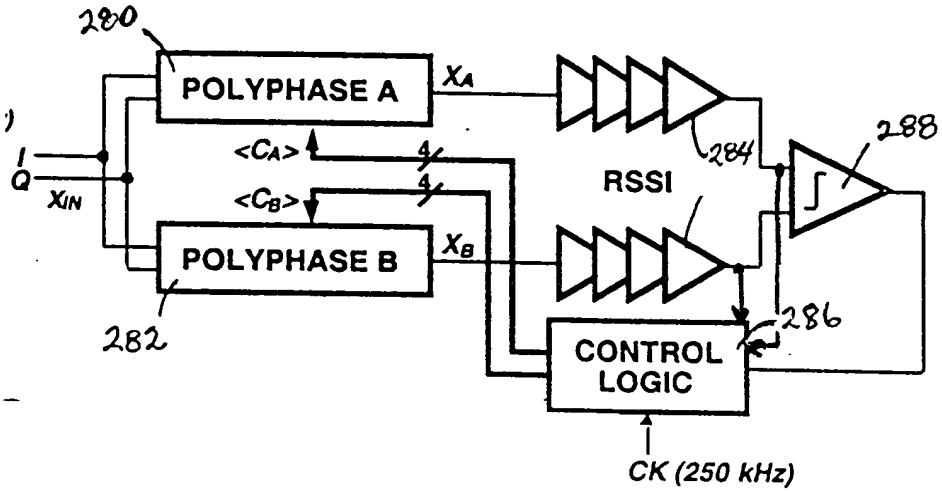

280
POLYPHASE A
X_A
$<C_A>$
4
I
Q
X_{IN}
$<C_B>$
4
RSSI
284
288
POLYPHASE B
X_B
286
282
CONTROL LOGIC
CK (250 kHz)

FIG. 40

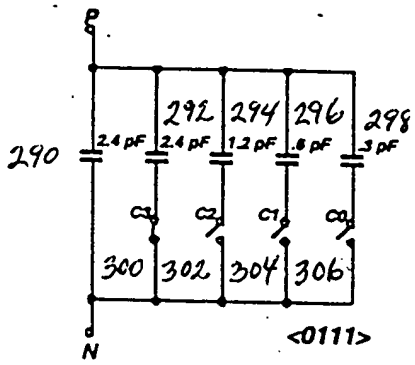

P
290
2.4 pF
292
2.4 pF
294
1.2 pF
296
.6 pF
298
.3 pF
C3
C2
C1
C0
300
302
304
306
N
<0111>

FIG. 41

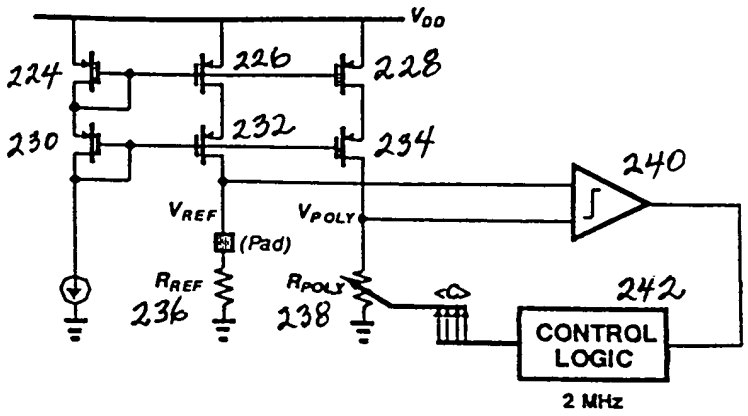

V_{DD}
224
226
228
230
232
234
240
V_{REF}
V_{POLY}
(Pad)
R_{REF}
236
R_{POLY}
238
242
CONTROL LOGIC
2 MHz

FIG. 42

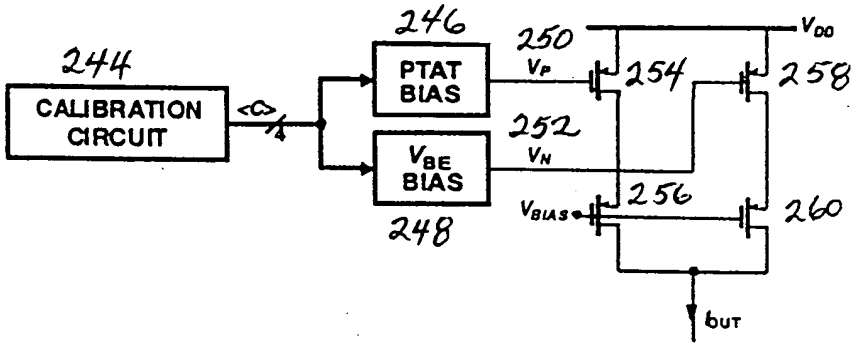

246
244
250
V_{DD}
PTAT BIAS
CALIBRATION CIRCUIT
<6>
4
V_P
254
258
252
V_{BE} BIAS
V_N
256
V_{BIAS}
260
248
6UT

FIG. 43

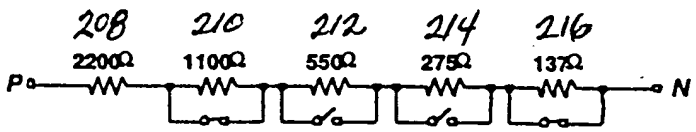


FIG. 44

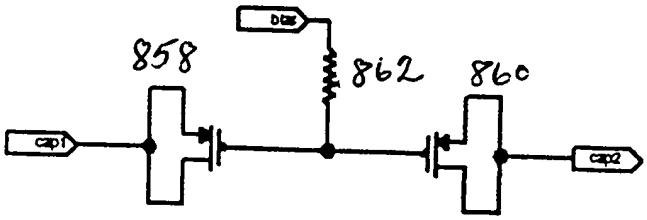


FIG. 45

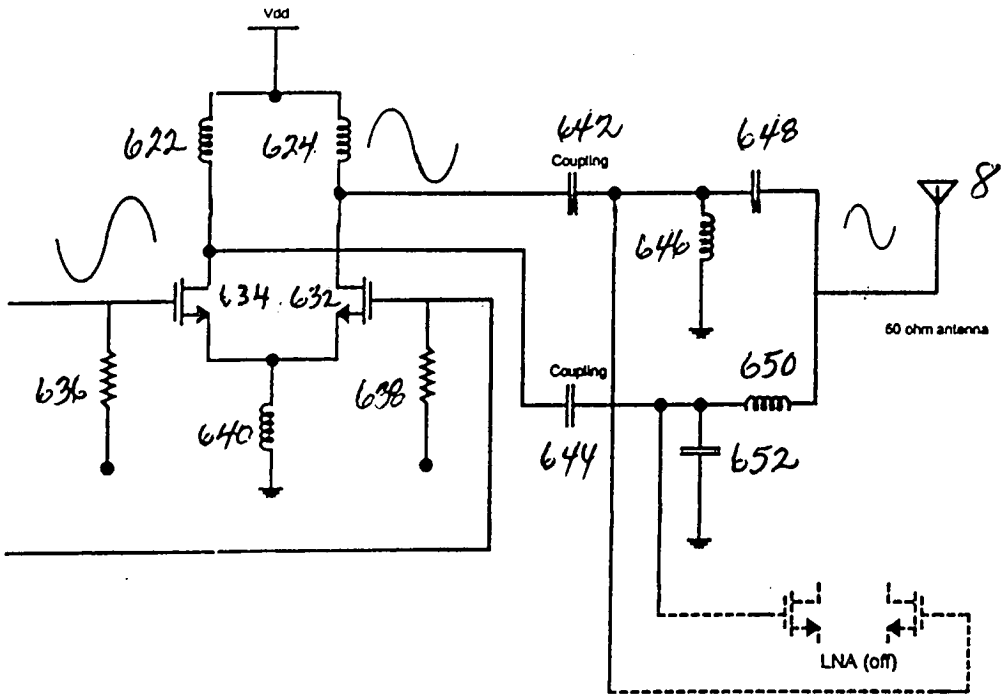


FIG. 46

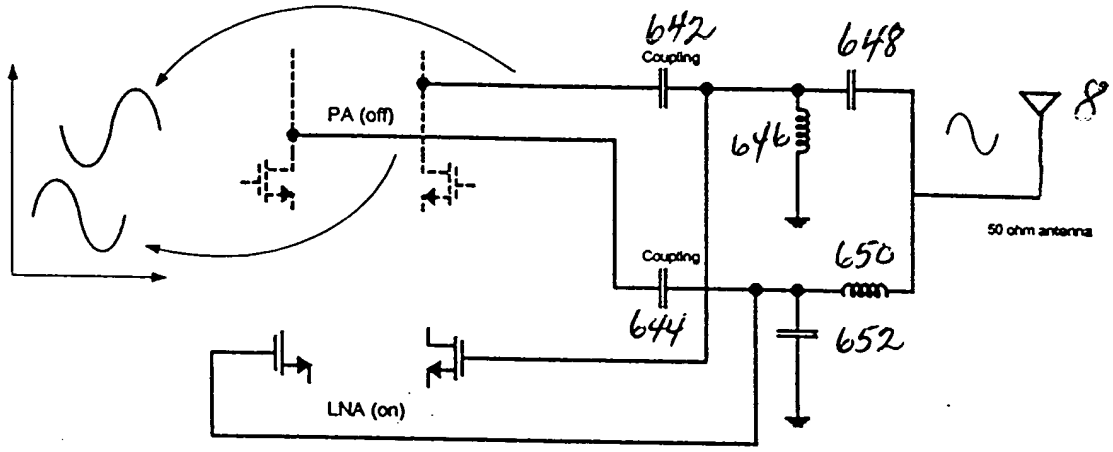

642
Coupling
648
PA (off)
646
8
50 ohm antenna
Coupling
650
644
652
LNA (on)

FIG. 47